

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 9612****Roll No.**

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**B.Tech.****(SEM. II) EVEN THEORY EXAMINATION 2012-13****ENGINEERING CHEMISTRY***Time : 3 Hours**Total Marks : 100***Note :—Attempt ALL questions.****SECTION—A**

1. Attempt all ten parts. Each part carries equal marks.

**(5×4=20)**

- (a) Explain why *p*-nitrophenol is more soluble than *o*-nitrophenol in water.
- (b) Why  $\beta$ -carotene absorbs light in visible region ? Explain.
- (c) Explain why benzyl carbonium ion is more stable than ethyl carbonium ion.
- (d) Calculate density of a BCC crystal. Side of cube is  $4 \text{ \AA}$  and  $M = 60$  (Avogadro's number =  $6.023 \times 10^{23}$ ).
- (e) Explain why Toluene undergoes electrophilic substitution reaction more easily than nitrobenzene.
- (f) 0.2 g of a coal sample was used in bomb calorimeter for sulfur estimation. The weight of precipitate was found to be 0.05 g. Calculate the percentage of sulfur in the coal sample.

- (g) Explain why Alkalinity of water cannot be due to simultaneous presence of  $\text{OH}^-$ ,  $\text{CO}_3^{--}$  and  $\text{HCO}_3^-$ .
- (h) During titration which gives accurate result either internal indicator method or external indicator method? Why?
- (i) Classify the following as electrophiles and nucleophiles:  $\text{H}_3\text{O}^+$ ,  $\text{NH}_3$ ,  $\text{BF}_3$ ,  $\text{ROH}$ ,  $\text{AlCl}_3$ .
- (j) Write two examples of each organometallic compound and bio degradable polymers.

### SECTION-B

2. Attempt any **three** parts of the following: (3×10=30)
- (a) (i) Draw the molecular orbital diagram of  $\text{O}_2$  and find out the bond order and magnetic behaviour.
  - (ii) A first order reaction takes 69.3 min for 50% completion. How much time will be needed for 80% completion?
  - (b) (i) What do you mean by the term permutit? Describe the softening of water by permutit process.
  - (ii) Discuss the structure, preparation, properties and application of fullerene.
  - (c) (i) What do you understand by extrinsic and intrinsic semi conductors?
  - (ii) 100 ml of water sample has a hardness equivalent of 12.5 ml of 0.08 N  $\text{MgSO}_4$ . What is its hardness in ppm?
  - (d) (i) Distinguish between order and molecularity of a reaction.
  - (ii) Comment on the relative stabilities of the conformers of n-butane.

- (e) (i) Write the possible optical isomers in tartaric acid.
- (ii) For a  $\text{XY}_2$  bent molecule show various types of stretching and bending vibration in IR.

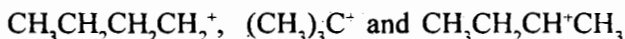
### SECTION-C

**Note:-** Attempt all **five** questions. Each question carries equal marks. (5×10=50)

3. Attempt any **one** part of the following:
- (a) (i) Describe in brief about conducting polymers with their applications.
  - (ii) Calculate the weight of air required for complete combustion of 3 kg of carbon.
  - (b) Discuss the mechanism and applications of Beckmann and Aldol condensation reaction.
4. Attempt any **one** part of the following:
- (a) (i) Distinguish between corrosion of Aluminium and Magnesium.
  - (ii) Draw the energy profile diagram for the reaction  $(\text{CH}_3)_3\text{CBr} + \text{OH}^- \rightarrow (\text{CH}_3)_3\text{COH} + \text{Br}^-$ .
  - (b) What do you mean by the term redox titration? Discuss the titrimetric analysis of ferrous ammonium sulphate against potassium dichromate using external indicator.
5. Attempt any **one** part of the following:
- (a) A coal has the following composition by weight: C = 90 %, O = 3%, S = 0.5%, N = 0.5% and Ash = 2.5 %. Net calorific value of the coal was found to be 8,490.5 kcal/kg. Calculate the percentage of hydrogen and Gross calorific value.

(b) (i) What is the importance of finger print region in IR spectroscopy ?

(ii) What are carbonium ions ? Arrange the following to increasing stability :



6. Attempt any **one** part of the following :

(a) Write the chemical structure and use of the following macrocoleules :

(i) Poly- $\epsilon$ -caprolactum

(ii) Polyethylene terephthalate

(iii) Methyl methacrylate

(iv) Cis-1,4-polyisoprene cross linked through non metal.

(b) Show that for a first order reaction the time required for 99.99% of the reaction to take place is twice as long as the time required for 99% of the reaction to take place.

7. Attempt any **one** part of the following :

(a) (i) In principle, is it possible to convert solid ice into water vapor ? Explain.

(ii) With the help of phase rule diagram show how it is possible to have super cooled water.

(b) (i) What do you mean by liquid crystals ? Discuss its classification and applications.

(ii) What is electrochemical corrosion ? Write down the mechanism involved in the said reaction.